PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

28 DEC 2004

Applicant's or agent's file reference URC041BWO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/05839	International filing date *(day/month/year)* 04.06.2003	Priority date *(day/month/year)* 28.06.2002
International Patent Classification (IPC) or both national classification and IPC C07C273/04		
Applicant UREA CASALE S.A.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
16.10.2003	18.10.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Delanghe, P Telephone No. +31 70 340-4119

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/05839

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-16	as originally filed

Claims, Numbers

1-13, 15	as originally filed
14	received on 28.09.2004 with letter of 28.09.2004

Drawings, Sheets

1/7-7/7	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☒ the claims, Nos.: 16

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-15
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. **Document**

Reference is made to the following document:
D1: WO 00/43358
D2: US 4 519 446

The document D2 was not cited in the international search report. A copy of the document is appended hereto.

2. **Subject matter**

Claims 1-15 define a plant for the production of urea from ammonia and carbon dioxide, using a high-pressure plant, comprising a reactor, a condenser, a stripper and a scrubber, all operated at high-pressure. The synthesis reactor and the condensation unit are located in the same reactor-shell. The condenser comprises a plurality of plate-shaped heat-exchangers, arranged with long sides parallel to the axis of the reactor. A higher condensation capacity and as a result a higher urea plant capacity is claimed over the prior art.

3. **Novelty**

There are no documents in the prior art disclosing a urea plant with a high-pressure section, which comprises a synthesis portion and a condensation unit inside the same reactor shell, wherein the condensation unit consists of a plurality of plate-shaped rectangular heat exchangers, arranged with long sides parallel of the reactor. Therefore, the present application does meet the criteria of Article 33(1) PCT, and the subject-matter of claims 1-15 is new in the sense of Article 33(2) PCT.

4. **Inventive step**

The document D1 is regarded as being the closest prior art to the subject matter of claim 1 and discloses (see page 4, line 25 - page 5, line 7, page 9, lines 15-18 and the figures) a plant comprising a reactor unit shell, which comprises a reactor and a condensation zone, wherein the condenser is a tubular heat exchanger (pool condenser). The subject-matter of claim 1 differs from this known D1 in that as the condenser a plurality of plate-shaped rectangular heat exchangers, parallel to the axis of the reactor, is used instead of a tubular heat exchanger.

The problem to be solved by the present invention may be regarded as an urea production plant, providing higher overall urea production capacity than that which can be obtained with the plant according to D1. The use of a plate-shaped condenser with higher cooling capacity makes an important contribution thereto.

The documents of the prior art do not suggest the use of a plate-shaped rectangular heat exchanger in a high pressure reactor/condenser process unit to solve the abovementioned problem. Thus, given the teaching of the prior art, the skilled person would not consider solving the problem by exchanging a tubular shaped condenser with a plate-shaped condenser as in the present application, and he certainly would not expect the improvement associated with the present application. Therefore, the solution proposed in claim 1 of the present application can be considered as involving an inventive step (Article 33(3) PCT).

Using the same argumentation the dependent claims 2-15 are also inventive.

of said metallic plates, extending perpendicularly to said ducts (31, 32).

11. Plant according to claim 10, characterised in that each of said chambers (121a) is internally equipped with a plurality of deflector plates (122), extending parallel to said ducts (31, 32) and defining a substantially winding path for said operating fluid.

12. Plant according to claim 1 and according to any one of claims 2 to 11, characterised in that said condensation unit has a substantially annular cylindrical configuration, crossed axially by a passage (14) with a predetermined diameter, in which said plurality of heat exchangers (17, 117, 123) are distributed in many coaxial and concentric rows, in a substantially radial arrangement.

13. Plant according to claim 2, characterised in that at least one of said exchangers (123) is internally equipped with a separator plate (124), extending from one side (123c) of said exchanger (123), towards a side (123b) opposite it and from which said plate (124) is in a predetermined distanced relationship, said plate (124) defining in said chamber (125) a substantially U-shaped fluid path having descending and ascending portions (125a, 125b), respectively, in communication with the outside of the exchanger through respective connectors (126, 127).

14. ~~Heat exchange unit~~Plant according to claim 13, characterised in that said separator plate (124) extends in said chamber (125) in a direction forming an angle with said side (123c), for which reason the portions (125a, 125b) of said fluid path inside the exchanger (123) have a gradually increasing cross-section.

15. Plant according to any one of the previous claims, characterised in that said exchangers (17, 117, 123) have predetermined cross sections of less than the cross sections of a manhole opening arranged in correspondence with a base plate of said reactor.

~~16. Condenser, in particular for the so-called high-pressure section of a plant for urea production from ammenia and carbon dioxide, comprising a condensation unit (7, 107) in turn comprising a plurality of flattened plate-shaped essentially rectangular heat exchangers (17, 117, 123), arranged with long sides (17a, 117a, 123a) parallel to the axis of said condenser.~~